Topics

1. Introduction

2. Turn back after IGARI

3. The Flight Simulator

4. The Transponder

MH370

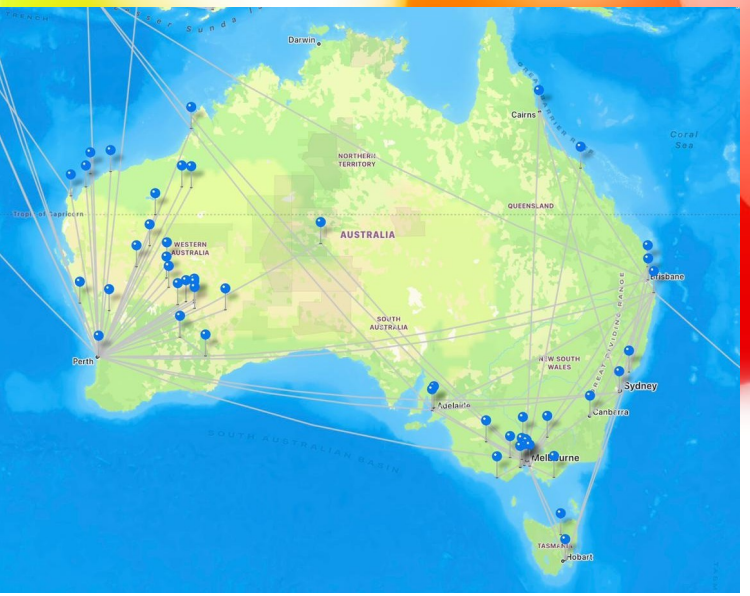
SIT DOWN WITH SID - PODCAST

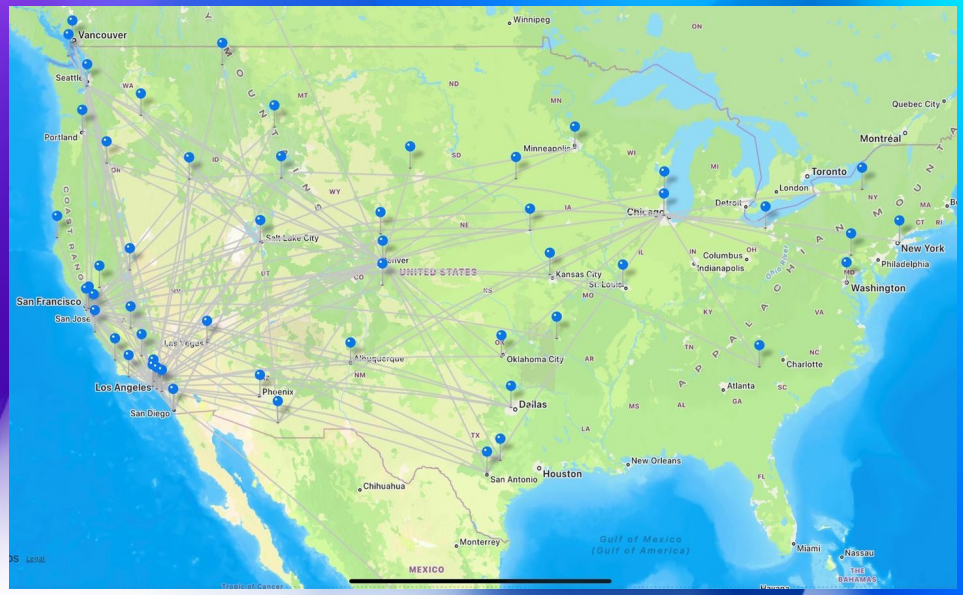
Juanda Ismail – Airline Pilot

Experience Over 8,500 hours flight time

Aircraft Types Airbus A320/A321, Embraer E190/E175, BAe146, MA60

Pilot Licenses ATPL - Air Transport Pilot License (CASA Australia) ,
ATP - Airline Transport Pilot (FAA - USA)





Regions Flown Australia, USA, Indonesia, Singapore, Malaysia, Thailand, New Zealand, Canada, Mexico, China, Philippines

MH370

1. INTRO

First Officer - on his last Line Training flight on the B777, being checked to line

Captain - TRI/TRE

First Officer - PF

Captain - PM

Could roles have changed after IGARI?

- Shortest angular distance for a 180-degree turn to the right, but turn was made to the left

- Turn was made with autopilot off

MH370

1-2 FLIGHT CONTEXT

- FIRST OFFICER UNDER LINE TRAINING

Transponder Mode S symbol disappeared 1 minute after saying Goodnight MH370
SSR symbol for MH370 disappears entirely a minute later off radar screens

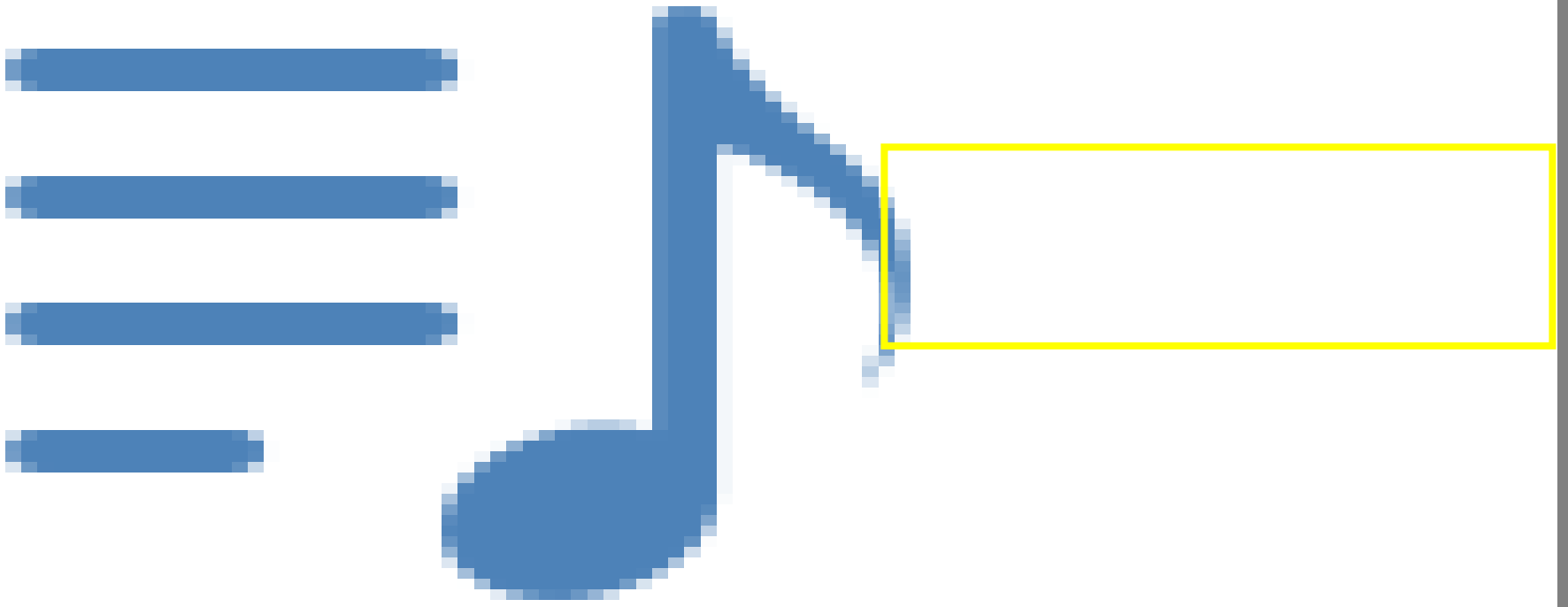
Military primary radar sees a blip turning towards BITOD waypoint and then making a 180-degree turn back towards Kota Bharu

MH370

2-1. THE TURN BACK FROM IGARI

MH370

2-3A. WITH AP ON, TURN WHICH WAY WOULD IT TURN?



Unusual for pilots to fly at these altitudes with the autopilot off.

- Only time this is trained for in the simulator, would be in UPRT

Autopilot can disengage **uncommanded** when there is a **systems failure or degradation**

Taking manual control of the aircraft and disengaging the autopilot does not imply any nefarious intent.

Hand-flying the aircraft is a normal and routine part of a pilot's responsibility to aviate.

MH370

2-1. HIGH ALTITUDE TURN WITH AUTOPILOT OFF

THE IMPLICATIONS

Coffin Corner -

The **stall speed** (minimum safe speed) and the **maximum safe speed** (limited by Mach buffet)
… get very close to each other.
It’s mitigated by keeping the autopilot ON at high altitudes

MH370

2-2. HIGH ALTITUDE TURN WITH AUTOPILOT OFF

THE IMPLICATIONS

Was MH370 tracking direct to VKB VOR?

How could this be done with the autopilot OFF?

MH370

1-6A. THE TURN BACK FROM IGARI

Tail of the needle pointing to VKB VOR

Simulation of the turn after IGARI

Simulated at 3X speed

Autopilot ON Indication’

Kota Bharu airport close at 11:30 PM – two hours after MH370 passes by

Runway lights unavailable – no Pilot Activated Lighting in Malaysia and this region

Penang Airport is open 24 hours a day

MH370

2-7A. KOTA BHARU AND PENANG

s STAR wayn

ENDOR is part of the Standard Arrival Procedure for aircraft landing in Penang

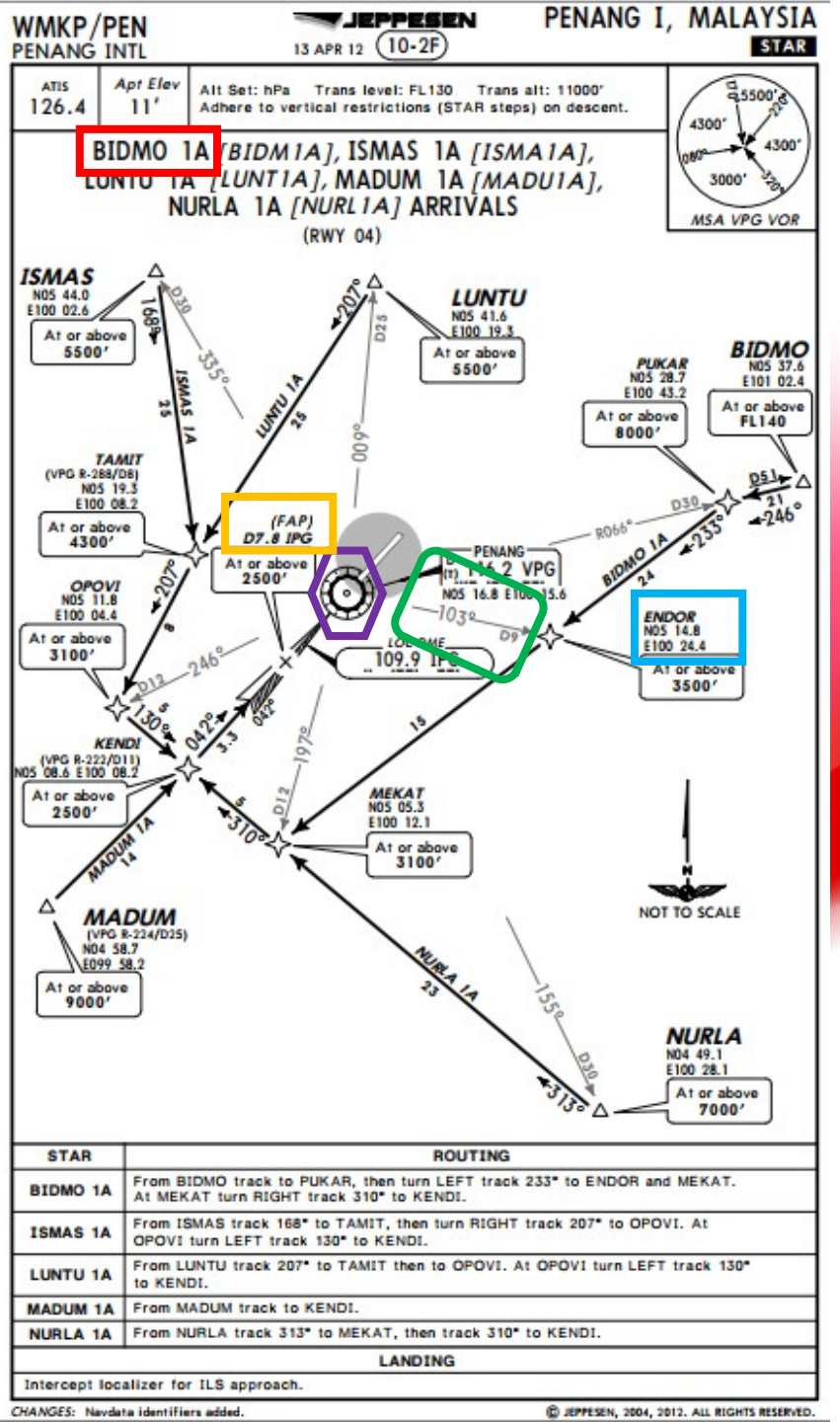
It’s not an enroute waypoint. ENDOR can only be loaded into the FMS after **changing the destination to Penang**

and then loading the BIDMO1A arrival

This therefore shows intent with the intention to land in Penang

MH370

2-9. THE TURN BACK FROM IGARI



STAR	ROUTING
BIDMO 1A	From BIDMO track to PUKAR, then turn LEFT track 233° to ENDOR and MEKAT. At MEKAT turn RIGHT track 310° to KENDI.
ISMAS 1A	From ISMAS track 168° to TAMIT, then turn RIGHT track 207° to OPOVI. At OPOVI turn LEFT track 130° to KENDI.
LUNTU 1A	From LUNTU track 207° to TAMIT then to OPOVI. At OPOVI turn LEFT track 130° to KENDI.
MADUM 1A	From MADUM track to KENDI.
NURLA 1A	From NURLA track 313° to MEKAT, then track 310° to KENDI.
LANDING	
Intercept localizer for ILS approach.	

CHANGES: Navdata identifiers added.

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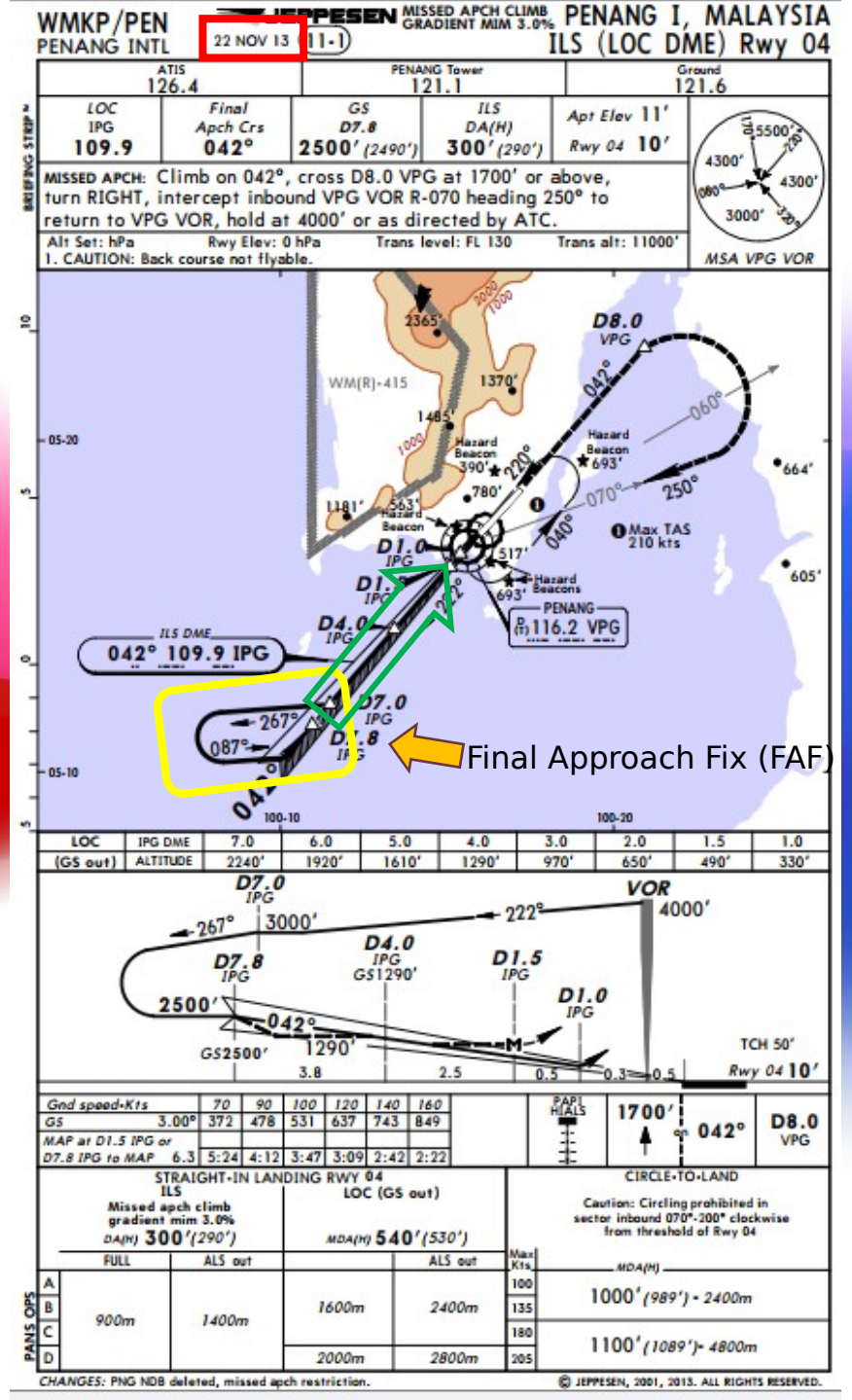

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MH370

2-10. THE TURN BACK FROM IGARI

D7.8

IPG

Topics

1. Introduction

2. Turn back after IGARI

3. Flight Simulator

MH370

SIT DOWN WITH SID - PODCAST

Why do pilots have home flight simulators?

Flying an aircraft is highly procedural. It is built around discipline, structure, and repetition.

It involves:

- Performing flows in a precise, logical sequence
- Making standard callouts at defined moments, depending on whether you are Pilot Flying or Pilot Monitoring
- Triggering specific, trained responses or actions from the other pilot based on those callouts

This structured interaction ensures both pilots remain synchronized and situationally aware.

Flight simulators reinforce this system by allowing crews to rehearse their roles, practise the timing of actions and callouts, and refine coordination in both normal and abnormal scenarios.

- Engine failures/fires after V1
- Emergency descents
- Windshear recovery
- TCAS Traffic Alerts/Resolution Advisory Actions
- Memory Items

1:1
ToLiSS
Interactive Simulation Control System
STARTUP SITUATIONS
A/C + SIM CONFIG
LOADING PERFO
GROUND SERVICES
FAULT SCENARIOS
SOUNDS ADDONS
JOYSTICK ACTIONS
SETTINGS ACCOUNTS
LOAD/SAVE SITUATIONS
AVAILABLE SITUATIONS
RTO ENG DAMAGE BEFORE V1
RTP ENG DAMAGE BEFORE V1
SF09
V1 CUT ENG1
V1 CUT ENG2
V1 ENG1 FIRE
FILTER SITUATIONS
SITUATION LOAD
CONFIG LOAD
WE RECOMMEND RUNNING ENGINES FOR SITUATION LOAD
SAVE SITUATION FILE NAME
SAVE SITUATION
AUTO-SAVING
AUTOSAVE ON/OFF: OFF
INTERVAL MIN
5
STARTUP
ENG 1 QUICK START
ENG 2 QUICK START
APU QUICK START
ADIRU QUICK ALIGN
AIRCRAFT STATE
ENG RUNNING: SET STATE
ADIRU + APU ON: SET STATE DEFAULT
EXT POWER ON: SET STATE DEFAULT
COLD + DARK: SET STATE DEFAULT
F/CTL LAW OVRD: ALTN DIRECT
FREEZE AIRCRAFT MOTION AND FUEL

he was promoted to captain and took his first command on the F50 aircraft.

By the end of 1991 he was promoted to Captain on the B737-400 until December 1996. His next promotion was to the A330-300 and stayed on the fleet until September 1998 when he was promoted to the B777-200ER fleet until the day of the event. By virtue of his good track record and seniority he was made a Type Rating Instructor (TRI) and Type Rating Examiner (TRE) on this present fleet effective November 2007.

The PIC's flying record for the last 72 hours and preceding 28 days' cycle were well within the Company's specified limits. His last flight as an operating PIC was to Denpasar, Bali, in the Republic of Indonesia on 03 March 2014. This was a daily return flight with a sector time of approximately 3 hours. On the day of the event, he was conducting training for the FO who was functionally checked out.

2) Royal Malaysia Police's Report on Flight Simulator of PIC

The Royal Malaysia Police (RMP) seized the PIC's home flight simulator from the residence of the PIC on 15 March 2014.

The RMP Forensic Report dated 19 May 2014 documented more than 2,700 coordinates retrieved from separate file fragments and most of them are default game coordinates.

It was also discovered that there were seven 'manually programmed' waypoint[4] coordinates (*Figure 1.5A* [below), that when connected together, will create a flight path from KLIA to an area south of the Indian Ocean through the Andaman Sea. These coordinates were stored in the Volume Shadow Information (VSI) file dated 03 February 2014. The function of this file was to save information when a computer is left idle for more than 15 minutes. Hence, the RMP Forensic Report could not determine if the waypoints came from one or more files.

The RMP Forensic Report on the simulator also did not find any data that showed the aircraft was performing climb, attitude or heading manoeuvres, nor did they find any data that showed a similar route flown by MH370.

The RMP Forensic Report concluded that there were no unusual activities other than game-related flight simulations.

[4] 'Manually programmed waypoints' - Manually programmed waypoints are waypoints that are not published in Airway Charts

Would flight simulator be useful in programming a flight route of several hours to the Southern Indian Ocean?

What would be the aim of programming such a flight?

If to see whether the aircraft has the fuel and endurance to perform this flight, this would be better planned using specific aircraft performance manuals

MH370

3-3. THE FLIGHT SIMULATOR

Topics

1. Introduction

2. Turn back after IGARI

3. Flight Simulator

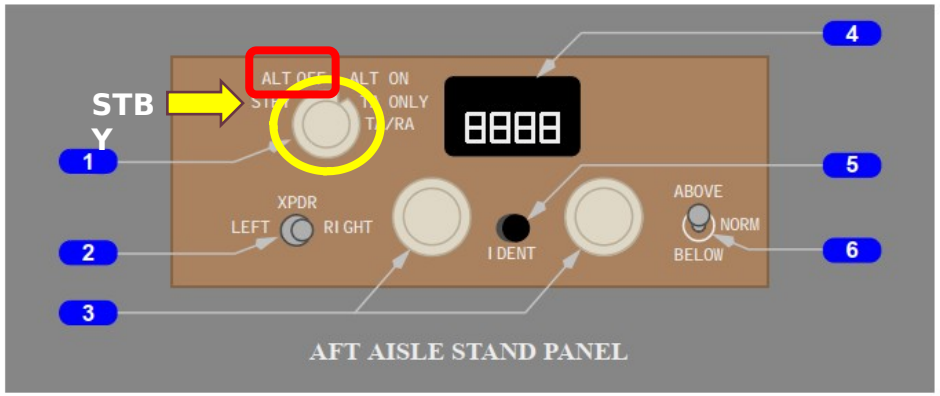
4. The Transponder

MH370

SIT DOWN WITH SID - PODCAST

Transponder – Bendix/King TRA-67A Mode S transponder

Transponder Panel



1 Transponder Mode Selector

STBY (standby) – transponder disabled.

ALT OFF (altitude) –

- transponder enabled in modes A and S
- altitude reporting disabled

ALT ON (altitude) –

- transponder enabled in modes A, C, and S
- in flight, altitude reporting enabled

TA ONLY (traffic advisory) and TA/RA (traffic advisory/resolution advisory) – Refer to Chapter 15, Warning Systems.

2 Transponder (XPDR) Switch

LEFT – selects left transponder and ADIRU as source for transponder altitude reporting.

RIGHT – selects right transponder and SAARU as source for transponder altitude

Disclaimer: I am not an avionics engineer
Happy to be corrected

MH370

4-1. THE TRANSPONDER –
WAS IT TURNED OFF DELIBERATELY?

Transponder – Bendix/King TRA-67A Mode S transponder

Mode A, Mode C, Mode S and ADS-B is an evolution of transponder technology

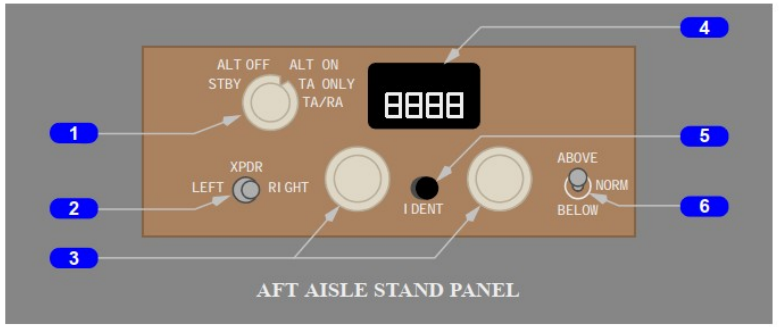
All combined into the one transponder unit using the same hardware and antenna

Mode A – 1950's – 1960's
- Users 4-digit squawk code to identify aircraft

Mode C – 1960's to 1970's
- Altitude added thereby allowing vertical separation

Mode S – **Selective Surveillance** -1980's to 1990's
- unique ICAO 24-bit aircraft address
- datalink capability eg, transmission of
  - aircraft selected altitude
  - GPS / IRU Position
  - IAS, TAS, Mach
  - Baro and Geo altitude

Transponder Panel



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TA ONLY (traffic advisory) and TA/RA (traffic advisory/resolution advisory) – Refer to Chapter 15, Warning Systems.

ADS-B an extension of **Mode S, Early 2000's**

- with continuous broadcast to a ground receiver.

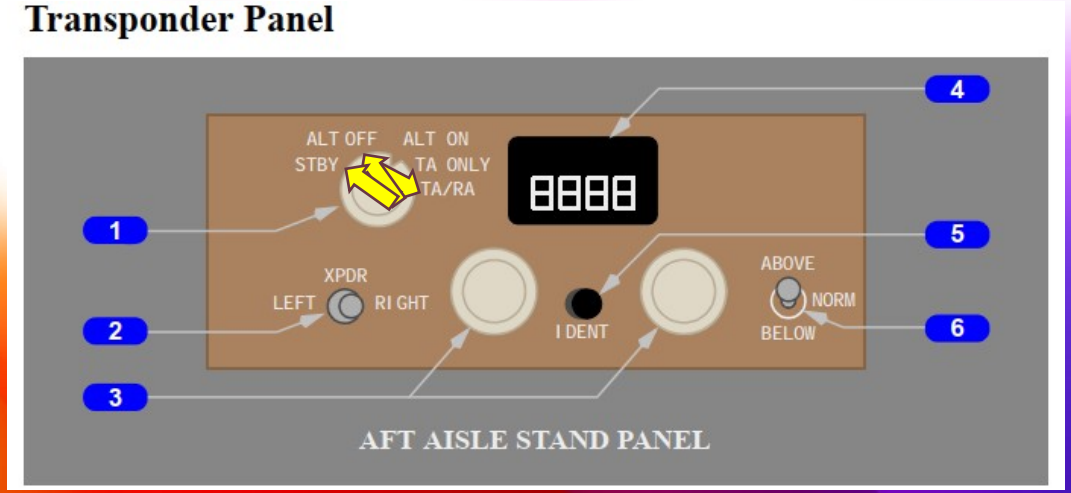
- Unlike Mode A, Mode C and **Mode S, ADS-B transmits data without interrogation by a ground station**

MH370

4-2. THE TRANSPONDER –

WHAT IS MODE A, MODE C, MODE S AND ADS-B?

Transponder Panel



MH370

4-3. WAS THE TRANSPONDER – TURNED OFF DELIBERATELY?

ADS-B data log from Kuala Terengganu ground station

Source: https://www.mh370-caption.net/index.php/caption-datasets/

	A	B	C	D	E	F	G	H	I	J	K
1	UTC	ModeA	lat	lon	galt	FL	BVR	VR	GS	TA	CS
3560	17:20:21	2157	6.9082599	103.57374	37350	350		0	472.4121	33.64563	MAS370
3561	17:20:21	2157	6.9093489	103.57449	37350	350		0			MAS370
3562	17:20:22	2157	6.9100785	103.575	37350	350		0			MAS370
3563	17:20:22	2157	6.9108134	103.57546	37350	350		0			MAS370
3564	17:20:23	2157	6.911892	103.57621	37350	350		0			MAS370
3565	17:20:23	2157	6.9129645	103.57700	37350	350		0			MAS370
3566	17:20:24	2157	6.913651	103.57751	37350	350		0			MAS370
3567	17:20:24	2157	6.9147294	103.57829	37350	350		0			MAS370
3568	17:20:25	2157	6.9154268	103.57881	37350	350		62.5			MAS370
3569	17:20:25	2157	6.9164890	103.57956	37350	350		62.5	471.9727	36.94702	MAS370
3570	17:20:26	2157	6.9171756	103.58012	37350	350		62.5			MAS370
3571	17:20:26	2157	6.9182217	103.58089	37350	350		62.5			MAS370
3572	17:20:27	2157	6.9189190	103.58146	37350	350		0	471.3135	37.62817	MAS370
3573	17:20:27	2157	6.9199651	103.58226	37350	350		0			MAS370
3574	17:20:28	2157	6.9206088	103.58282	37350	350		0			MAS370
3575	17:20:28	2157	6.9212955	103.58333	37350	350		0			MAS370
3576	17:20:29	2157	6.9223201	103.58417	37350	350		0			MAS370
3577	17:20:29	2157	6.9230175	103.58473	37350	350		0			MAS370
3578	17:20:30	2157	6.9240421	103.58557	37350	350		0			MAS370
3579	17:20:30	2157	6.9246804	103.58612	37350	350		0			MAS370
3580	17:20:31	2157	6.9257158	103.58696	37350	350		0			MAS370
3581	17:20:32	2157	6.9273358	103.58841	37350	350		0			MAS370
3582	17:20:32	2157	6.9280225	103.58897	37350	350		0			MAS370
3583	17:20:33	2157	6.9286662	103.58957	37350	350		0			MAS370
3584	17:20:33	2157	6.9296747	103.59042	37350	350		0			MAS370
3585	17:20:34	2157	6.9302755	103.59103	37350	350		0	470.874	41.93481	MAS370
3586	17:20:34	2157	6.9312733	103.59190	37350			0			MAS370
3587	17:20:35	2157	6.9319170	103.59250	37350			0	471.3135	42.53906	MAS370
3588											

KT_ADSB_MH370_UTC

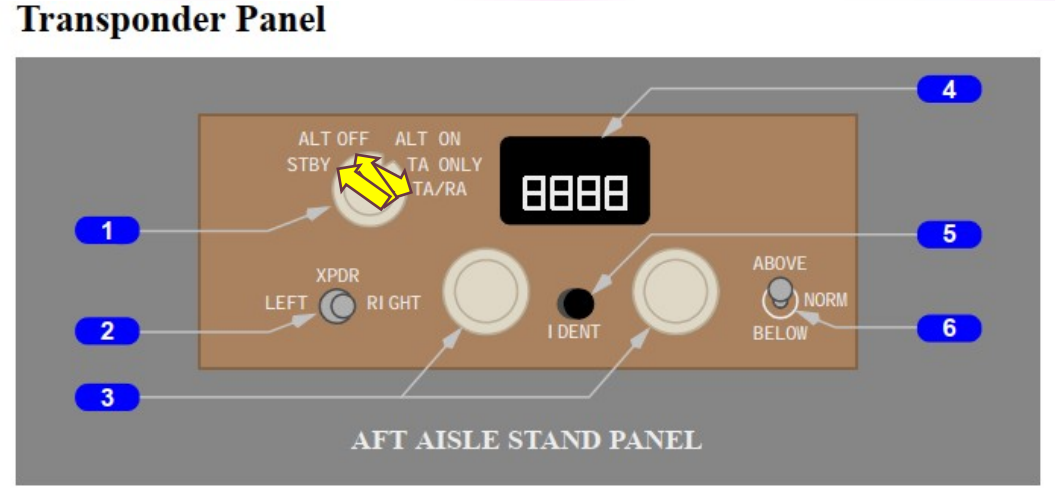
Source: Independent Group 2019

	Time	id	Identification	Vx_knot	Vy_knot	Mode3A	FL	ICAO	Latitude	Longitude
3561	17:20:22	226181	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.910813	103.5755
3562	17:20:23	226194	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.911891	103.5762
3563	17:20:23	226206	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.912964	103.577
3564	17:20:24	226220	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.913651	103.5775
3565	17:20:24	226234	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.91473	103.5783
3566	17:20:25	226246	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.915427	103.5788
3567	17:20:25	226260	MAS370 _3414F3DF0820	283.9942	376.9689	2157	350	75008F	6.916489	103.5796
3568	17:20:26	226268	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.917176	103.5801
3569	17:20:26	226275	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.918221	103.5809
3570	17:20:27	226287	MAS370 _3414F3DF0820	288.0582	373.0401	2157	350	75008F	6.918919	103.5815
3571	17:20:27	226298	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.919965	103.5823
3572	17:20:28	226310	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.920609	103.5828
3573	17:20:28	226318	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.921296	103.5833
3574	17:20:29	226328	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.92232	103.5842
3575	17:20:29	226336	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.923018	103.5847
3576	17:20:30	226348	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.924042	103.5856
3577	17:20:30	226359	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.92468	103.5861
3578	17:20:31	226367	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.925716	103.587
3579	17:20:32	226376	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.927336	103.5884
3580	17:20:32	226388	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.928022	103.589
3581	17:20:33	226396	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.928666	103.5896
3582	17:20:33	226407	MAS370 _3414F3DF0820	0	0	2157	350	75008F	6.929675	103.5904
3583	17:20:34	226418	MAS370 _3414F3DF0820	314.9968	349.9991	2157	350	75008F	6.930275	103.591
3584	17:20:34	226428	MAS370 _3414F3DF0820	0	0	2157	0	75008F	6.931273	103.5919
3585	17:20:35	226437	MAS370 _3414F3DF0820	318.9723	346.977	2157	0	75008F	6.931917	103.5925

MH370

4-4. THE TRANSPONDER – ADS-B DATA LOG

The question is whether the ‘no altitude’ entries in the ADS-B logs could be explained by something other than the transponder selector briefly passing through the ALT OFF position while being deliberately moved to STBY to switch the transponder off.”



My answer is ……..

I don’t know. I would like to see further testing done to confirm

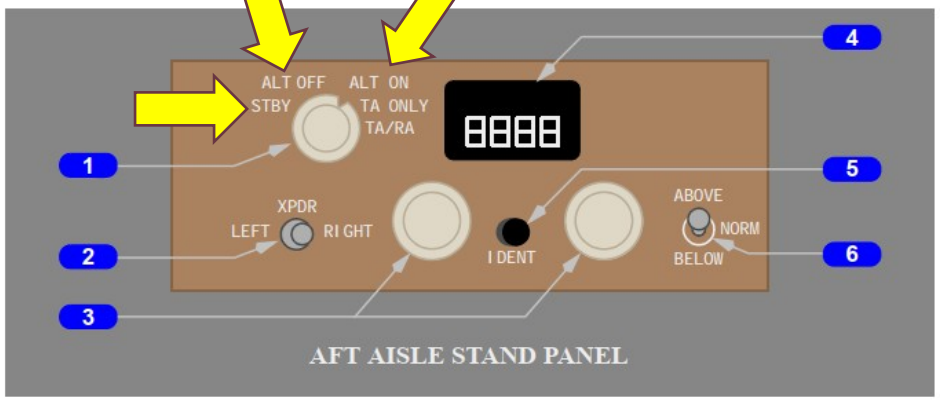
This is why ….

MH370

4-5. THE TRANSPONDER – THE DEBATE

Transponder – Bendix/King TRA-67A Mode S transponder

Transponder Panel



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TA ONLY (traffic advisory) and TA/RA (traffic advisory/resolution advisory) – Refer to Chapter 15, Warning Systems.

2 Transponder (XPDR) Switch

LEFT – selects left transponder and ADIRU as source for transponder altitude reporting.

RIGHT – selects right transponder and SAARU as source for transponder altitude

ALT OFF – disables Mode C

Disclaimer: I am not an avionics engineer
Happy to be corrected

Does it also disable the transmission of barro altitude in ADS-B Out?

This is what needs to be tested **inflight**

MH370

4-6. THE TRANSPONDER –
WAS IT TURNED OFF DELIBERATELY?

Kota Bharu SSR Mode S Data

Source: https://www.mh370-caption.net/index.php/caption-datasets/

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	UTC	type	rho	theta	x	y	FL	CGS	CHdg	lat	lon	lat2	lon2	MCPAlt	roll	trackAngle	trackAngle	GS	heading	IAS	TAS	mach	ve
416	17:19:03	5	80.55469	63.84155	72.03906	35.4375	350	471.3135	25.54321	6.756849	103.5007	6.757102	103.4993	35008	0.35	25.49		474	27.2	278	482	0.82	
417	17:19:07	5	80.94531	63.51196	72.24219	35.90625	350	472.6318	25.32349	6.766712	103.5031	6.764952	103.5027	35008	0.18	25.49		474	27.2	278	482	0.82	
418	17:19:11	5	81.33594	63.33069	72.45313	36.36719	350	473.0713	25.25757	6.773482	103.5071	6.772672	103.5063	35008	0.35	25.49		474	27.2	278	482	0.82	
419	17:19:15	5	81.73438	63.06152	72.65625	36.83594	350	474.1699	25.0708	6.782209	103.5101	6.780522	103.5097	35008	0.35	25.49		474	27.2	278	482	0.82	
420	17:19:18	5	82.13281	62.91321	72.875	37.28906	350	474.1699	25.12024	6.788404	103.5145	6.78811	103.5133	35008	0	25.49		474	27.1	278	482	0.82	
421	17:19:22	5	82.52344	62.71545	73.09375	37.73438	350	473.5107	25.19714	6.795622	103.5182	6.795567	103.517	35008	0	25.49		474	27.2	278	482	0.82	
422	17:19:26	5	82.92188	62.47375	73.30469	38.1875	350	474.8291	25.16968	6.803876	103.5214	6.803156	103.5205	35008	0	25.49		474	27.2	278	482	0.82	
423	17:19:30	5	83.32031	62.29248	73.52344	38.64063	350	474.3896	25.2356	6.81087	103.5253	6.810744	103.5242	35008	0.18	25.49		474	27.2	278	482	0.82	
424	17:19:34	5	83.71875	62.08374	73.73438	39.08594	350	472.8516	25.27954	6.818487	103.5289	6.818201	103.5277	35008	0.18	25.49		474	27.2	279	482	0.82	
425	17:19:38	5	84.125	61.88599	73.95313	39.53125	350	472.6318	25.33997	6.825962	103.5326	6.825659	103.5314	35008	0.18	25.49		474	27.2	278	482	0.82	
426	17:19:41	5	84.52344	61.64429	74.16406	39.99219	350	473.0713	25.26306	6.834362	103.5357	6.833378	103.535	35008	0.18	25.49		474	27.2	278	482	0.82	
427	17:19:45	5	84.92969	61.45203	74.375	40.44531	350	473.291	25.24109	6.841787	103.5395	6.840966	103.5385	35008	0.35	25.49		474	27.2	277	482	0.816	
428	17:19:49	5	85.33594	61.27625	74.59375	40.89844	350	473.0713	25.29602	6.848885	103.5434	6.848554	103.5422	35008	0.18	25.49		474	27.2	278	482	0.82	
429	17:19:53	5	85.73438	61.073	74.80469	41.35156	350	472.8516	25.30701	6.856551	103.5468	6.856143	103.5457	35008	0.18	25.49		474	27.1	277	482	0.816	
430	17:19:57	5	86.14063	60.8313	75.01563	41.8125	350	473.7305	25.17517	6.865157	103.5498	6.863862	103.5492	35008	0	25.49		474	27.1	277	482	0.816	
431	17:20:00	5	86.55469	60.73792	75.24219	42.25	350	472.4121	25.3949	6.870602	103.5547	6.871188	103.553	35008	0.18	25.49		474	27.1	277	480	0.816	
432	17:20:04	5	86.96094	60.5072	75.46094	42.69531	350	472.4121	25.43884	6.879033	103.5578	6.878646	103.5567	35008	0.18	25.49		474	27.1	277	480	0.816	
433	17:20:08	5	87.36719	60.32593	75.67188	43.14063	350	473.291	25.49377	6.886407	103.5615	6.886103	103.5603	35008	5.98	25.66		474	27.8	277	482	0.816	
434	17:20:12	5	87.78125	60.14465	75.89063	43.58594	350	472.8516	25.55969	6.893876	103.5652	6.89356	103.5639	35008	16	27.07		474	29.9	277	480	0.816	
435	17:20:16	5	88.21094	59.98535	76.11719	44.02344	350	471.3135	25.71899	6.901017	103.5694	6.900887	103.5677	35008	18.28	29.88		474	32.5	277	482	0.816	
436	17:20:19	5	88.64844	59.82056	76.35156	44.46875	350	471.0938	25.93323	6.908376	103.5737	6.908344	103.5717	35008	17.58	32.87		472	35.2	278	482	0.82	
437	17:20:23	5	89.10156	59.60632	76.58594	44.92188	350	472.4121	26.04309	6.917007	103.5774	6.915933	103.5756	35008	16.52	35.68		472	37.6	278	482	0.82	
438	17:20:27	5	89.55469	59.55688	76.84375	45.34375	350	471.7529	26.5979	6.921967	103.5833	6.922998	103.5799	35008	15.82	37.62		472	40.1	278	482	0.82	
439	17:20:31	5	90.02344	59.3811	77.16406	45.75	350	474.8291	29.75647	6.929929	103.5878	6.929801	103.5853	35008	15.47	40.08		472	42.4	278	482	0.82	
440	17:20:35	0	90.40234	59.17786	77.41406	46.1875	0	474.8291	29.75647	6.939346	103.5932	6.937129	103.5895	35008	15.47	40.08		472	42.4	278	482	0.82	
441	17:20:38	0	90.83984	59.01855	77.66406	46.625	0	474.8291	29.75647	6.946729	103.5973	6.944455	103.5937	35008	15.47	40.08		472	42.4	278	482	0.82	
442	17:20:42	0	91.01953	58.86475	77.90625	47.0625	0	476.1475	29.75647	6.951783	103.5978	6.951782	103.5977	35008	15.47	40.08		472	42.4	278	482	0.82	
443	17:20:47	0					0																

0 = 'no detection'

0 = 'FL 0'

4-7. THE TRANSPONDER – WHY THE NEED FOR TESTING?

Kota Bharu SSR Mode S Data

	UTC	type	rho	theta	x	y	FL	CGS	CHdg	lat	lon	lat2	lon2	MCPAlt	roll	trackAngle	trackAngle	GS	heading	IAS	TAS	mach	vertRate	m
365	17:15:49	5	62.67188	78.56323	61.10938	12.35938	350	472.6318	25.30701	6.370875	103.317	6.37062	103.3161	35008	0.18	25.31		474	26.7	277	480	0.816		
366	17:15:53	5	62.96875	78.22266	61.32813	12.8125	350	471.9727	25.35645	6.377979	103.3207	6.378208	103.3197	35008	0.18	25.31		474	26.9	278	482	0.82		
367	17:15:56	5	63.27344	77.79419	61.53906	13.27344	350	472.8516	25.28503	6.386744	103.3241	6.385928	103.3233	35008	0.35	25.31		474	26.9	278	482	0.82		
368	17:16:00	5	63.57813	77.42065	61.75	13.73438	350	473.7305	25.20813	6.394579	103.3276	6.393647	103.3268	35008	0.35	25.49		474	26.9	278	482	0.82		
369	17:16:04	5	63.88281	77.16797	61.96875	14.17188	350	472.4121	25.32349	6.400279	103.3316	6.400974	103.3305	35008	0.18	25.49		474	26.9	278	482	0.82		
370	17:16:08	5	64.19531	76.7395	62.1875	14.63281	350	472.6318	25.29053	6.409247	103.3349	6.408693	103.3341	35008	0.53	25.49		474	26.9	278	482	0.82		
371	17:16:12	5	64.50781	76.40991	62.39844	15.08594	350	472.6318	25.29602	6.416472	103.3386	6.416281	103.3377	35008	0.18	25.49		474	26.9	278	482	0.82		
372	17:16:16	5	64.82031	76.03638	62.60938	15.54688	350	474.1699	25.24658	6.424553	103.342	6.424001	103.3412	35008	0	25.49		474	26.7	278	482	0.82		
373	17:16:19	5	65.14063	75.68481	62.82031	16.00781	350	473.5107	25.20264	6.432318	103.3456	6.43172	103.3447	35008	0	25.49		474	26.7	278	482	0.82		
374	17:16:23	0	65.45703	75.36621	63.03906	16.46094	0	474.8291	25.20264	6.440584	103.3533	6.439309	103.3484	35008	0	25.49		474	26.7	278	482	0.82		
375	17:16:27	5	65.78125	74.99268	63.25	16.92969	350	477.6855	24.90051	6.447806	103.3527	6.447158	103.3519	35008	0	25.31		474	26.9	278	482	0.82		
376	17:16:31	5	66.10938	74.65759	63.46094	17.39844	350	478.7842	24.81812	6.45546	103.3563	6.455008	103.3555	35008	0.18	25.31		474	26.9	277	480	0.816		
377	17:16:35	5	66.42969	74.38843	63.67969	17.83594	350	475.4883	25.12024	6.461903	103.3601	6.462335	103.3591	35008	0.18	25.31		474	26.9	278	482	0.82		
378	17:16:38	5	66.75781	74.04236	63.89063	18.28125	350	474.6094	25.18616	6.469861	103.3636	6.469793	103.3627	35008	0.18	25.31		474	26.9	278	482	0.82		
379	17:16:42	5	67.08594	73.65234	64.10156	18.75781	350	476.3672	24.95544	6.478696	103.3668	6.477773	103.3662	35008	0.53	25.31		474	26.9	278	482	0.82		
380	17:16:46	5	67.42188	73.38867	64.3125	19.20313	350	475.708	25.03784	6.485249	103.3708	6.485231	103.3697	35008	0.35	25.49		474	26.9	278	482	0.82		
381	17:16:50	5	67.75	73.11951	64.53125	19.64063	350	473.7305	25.21362	6.491912	103.3745	6.492558	103.3734	35008	0.18	25.49		474	26.9	278	482	0.82		
382	17:16:54	5	68.09375	72.76245	64.74219	20.09375	350	473.5107	25.2356	6.500359	103.378	6.500146	103.377	35008	0.18	25.49		474	26.9	278	482	0.82		
383	17:16:57	5	68.42969	72.41089	64.95313	20.55469	350	474.3896	25.14771	6.508717	103.3813	6.507865	103.3805	35008	0.18	25.49		474	26.9	278	482	0.82		
384	17:17:01	5	68.76563	72.11975	65.16406	21.00781	350	474.3896	25.12024	6.515978	103.3849	6.515454	103.384	35008	0.18	25.49		474	26.9	278	482	0.82		
385	17:17:05	5	69.10938	71.81763	65.38281	21.46875	350	474.3896	25.10376	6.523534	103.3885	6.523173	103.3877	35008	0.18	25.49		474	27.1	278	482	0.82		
386	17:17:09	5	69.45313	71.54846	65.59375	21.91406	350	473.9502	25.16418	6.530506	103.3923	6.53063	103.3912	35008	0.35	25.49		474	27.1	278	482	0.82		
387	17:17:13	5	69.79688	71.21887	65.80469	22.36719	350	475.2686	25.14221	6.538685	103.3956	6.538219	103.3948	35008	0.18	25.49		474	27.1	278	482	0.82		
388	17:17:17	5	70.14844	70.93872	66.02344	22.82031	350	473.7305	25.16418	6.546002	103.3994	6.545807	103.3984	35008	0.35	25.49		474	27.1	278	482	0.82		
389	17:17:20	5	70.5	70.69702	66.24219	23.25781	350	472.6318	25.30151	6.55262	103.4033	6.553134	103.4021	35008	0.35	25.49		474	27.1	278	482	0.82		
390	17:17:24	5	70.85156	70.3894	66.45313	23.70313	350	472.1924	25.36194	6.560559	103.4068	6.560591	103.4056	35008	0.18	25.49		474	27.1	278	482	0.82		
391	17:17:28	5	71.20313	70.03235	66.66406	24.17188	350	473.0713	25.25208	6.569511	103.4098	6.568441	103.4092	35008	0.18	25.49		474	27.1	278	482	0.82		
392	17:17:32	5	71.5625	69.74121	66.875	24.63281	350	473.9502	25.1532	6.577272	103.4134	6.57616	103.4127	35008	0.18	25.49		474	27.1	278	482	0.82		
393	17:17:36	5	71.91406	69.48853	67.08594	25.08594	350	473.9502	25.13672	6.58428	103.4171	6.583749	103.4162	35008	0	25.49		474	27.1	278	482	0.82		

0 = 'no detection'

0 = 'FL 0'

MH370

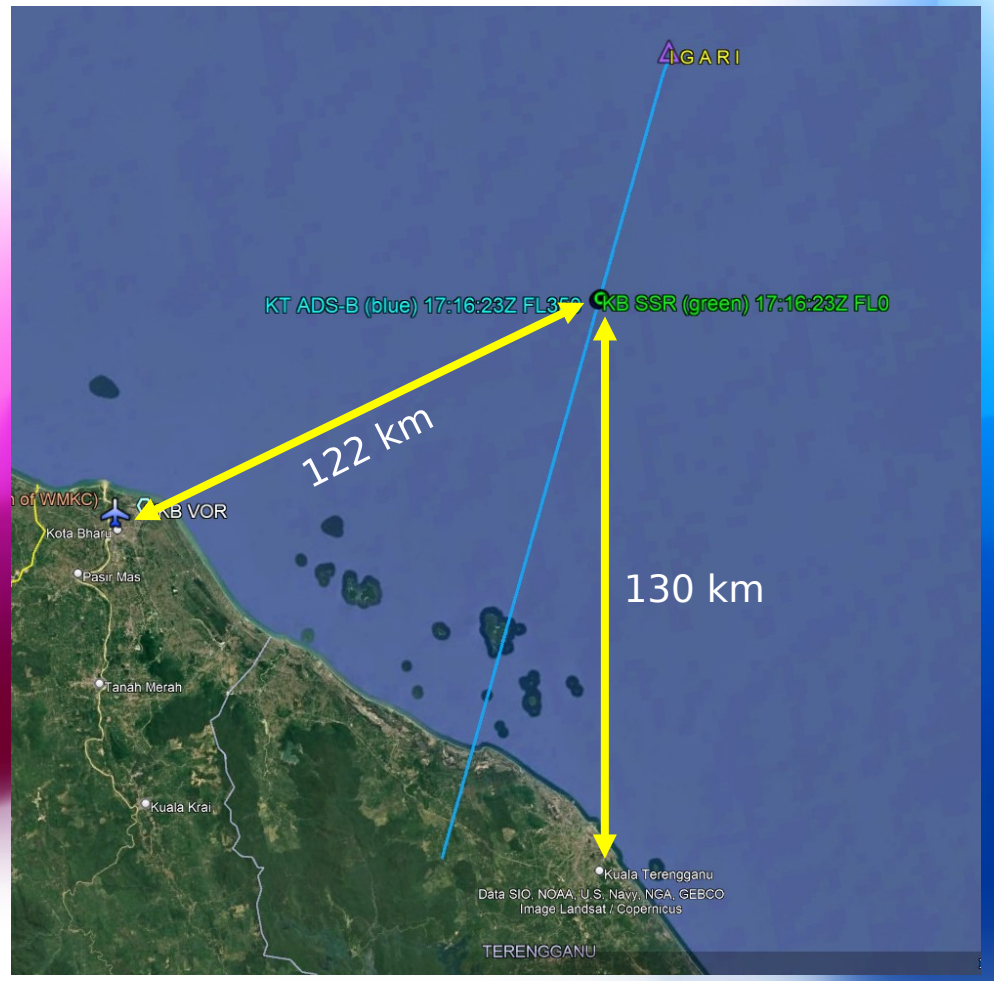
4-8. THE TRANSPONDER – WHY THE NEED FOR TESTING?

Kuala Terengganu ADS-B Data

Source: https://www.mh370-caption.net/index.php/caption-datasets/

1	UTC	ModeA	lat	lon	galt	FL	B
3071	17:16:19	2157	6.4283752	103.34308	37350	350	
3072	17:16:19	2157	6.4295607	103.34365	37350	350	
3073	17:16:20	2157	6.430757	103.3442	37350	350	
3074	17:16:20	2157	6.4315348	103.34461	37350	350	
3075	17:16:21	2157	6.4323127	103.34499	37350	350	
3076	17:16:21	2157	6.4335197	103.34554	37350	350	
3077	17:16:22	2157	6.4343082	103.34592	37350	350	
3078	17:16:22	2157	6.4351022	103.34630	37350	350	
3079	17:16:23	2157	6.4362931	103.34689	37350	350	
3080	17:16:23	2157	6.4370709	103.34727	37350	350	
3081	17:16:23	2157	6.4378970	103.34764	37350	350	
3082	17:16:24	2157	6.4398497	103.34857	37350	350	
3083	17:16:25	2157	6.4410567	103.34913	37350	350	
3084	17:16:25	2157	6.4418774	103.34950	3735	350	
3085	17:16:26	2157	6.4438515	103.35047	37	350	
3086	17:16:27	2157	6.4446455	103.35085	350	350	
3087	17:16:27	2157	6.4446455	103.35085	7350	350	

'FL 350'



MH370

4-9. THE TRANSPONDER – WHY THE NEED FOR TESTING?

Thank You

MH370

SIT DOWN WITH SID - PODCAST